

WHAT IS CLAIMED IS:

1. A flip chip light emitting diode including:
 - a light-transmissive substrate;
 - a base semiconducting layer of a first conductivity type disposed on the
 - 5 light-transmissive substrate;
 - a conductive mesh disposed on the base semiconducting layer and in electrically conductive contact therewith;
 - light-emitting micromesas disposed in openings of the conductive mesh, each light emitting micromesa having a topmost layer of a second conductivity
 - 10 type that is opposite the first conductivity type;
 - a first conductivity type electrode disposed on the base semiconducting layer and in electrical communication with the electrically conductive mesh;
 - an insulating layer disposed over the electrically conductive mesh; and
 - a second conductivity type electrode layer disposed over the insulating
 - 15 layer and the light-emitting micromesas, the insulating layer insulating the second conductivity type electrode layer from the electrically conductive mesh.
2. The flip chip light emitting diode as set forth in claim 1, further including:
 - at least one conductive finger disposed on the base semiconducting layer,
 - 20 the at least one conductive finger effecting the electrical communication between the first conductivity type electrode and the conductive mesh.
3. The flip chip light emitting diode as set forth in claim 2, wherein the at least one conductive finger contacts the first conductivity type electrode but does not contact the conductive mesh, the electrical communication being
- 25 effected by electrical current flow between the at least one conductive finger and the conductive mesh passing through the base semiconducting layer.

4. The flip chip light emitting diode as set forth in claim 1, wherein the base semiconducting layer and the topmost layer are formed of group III-nitride materials.

5 5. The flip chip light emitting diode as set forth in claim 4, wherein the first conductivity type is n-type, and the second conductivity type is p-type.

6. The flip chip light emitting diode as set forth in claim 1, wherein the micromesas are square-shaped with dimensions of about three to twenty microns on a side.

10 7. The flip chip light emitting diode as set forth in claim 1, wherein the conductive mesh includes a rectangular grid.

8. The flip chip light emitting diode as set forth in claim 1, wherein at least two micromesas are disposed in each opening of the conductive mesh.

9. The flip chip light emitting diode as set forth in claim 1, wherein four micromesas are disposed in each opening of the conductive mesh.

15 10. The flip chip light emitting diode as set forth in claim 1, wherein micromesas each include:

slanted sidewalls arranged to reflect laterally directed light generally toward the light-transmissive substrate.

20 11. A flip chip light emitting diode including:
a light-transmissive substrate;
a base semiconducting layer of a first conductivity type disposed on the light-transmissive substrate;
light-emitting micromesas disposed on the base semiconducting layer;

a first conductivity type electrode disposed on the base semiconducting layer, the first conductivity type electrode including a bonding pad region and at least one conductive finger extending from the bonding pad region to effect electrical communication between the first conductivity type electrode and the light-emitting micromesas;

an insulating layer disposed over the base semiconducting layer and the at least one conductive finger of the first conductivity type electrode, the insulating layer having openings to expose the bonding pad region of the first conductivity type electrode and topmost portions of the micromesas; and

a second conductivity type electrode layer disposed over the insulating layer and the light-emitting micromesas, the insulating layer insulating the second conductivity type electrode layer from the at least one conductive finger of the first conductivity type electrode and the base semiconducting layer.

12. The flip chip light emitting diode as set forth in claim 11, wherein the micromesas have non-vertical sidewalls inclined at an angle selected to reflect light produced in the micromesas toward the light-transmissive substrate.

13. The flip chip light emitting diode as set forth in claim 11, wherein the micromesas have a lateral area between 9 square microns and 400 square microns.

14. The flip chip light emitting diode as set forth in claim 13, wherein the micromesas have a generally square lateral shape.

15. The flip chip light emitting diode as set forth in claim 11, wherein the micromesas electrically communicate with the at least one conductive finger of the first conductivity type electrode through the base semiconducting layer.

16. The flip chip light emitting diode as set forth in claim 11, further including:

a conductive mesh disposed on the base semiconducting layer, the micromesas being arranged in mesh openings defined by the conductive mesh.

5 17. The flip chip light emitting diode as set forth in claim 16, wherein the conductive mesh electrically communicates with the at least one conductive finger through the base semiconducting layer.

18. The flip chip light emitting diode as set forth in claim 16, wherein the at least one conductive finger forms part of the conductive mesh.

10 19. The flip chip light emitting diode as set forth in claim 11, wherein each micromesa includes:

a topmost layer of a second conductivity type, the second conductivity type being of an opposite conductivity from the first conductivity type, the second conductivity type electrode layer electrically contacting the topmost layer.

15 20. A flip chip light emitting diode including:

a light transmissive substrate;

a base semiconducting layer disposed on the light transmissive substrate;

light emissive micromesas arranged on the base semiconducting layer, the light emissive micromesas defining an active area of the light emitting diode;

20 a continuous electrode layer disposed over the active area and contacting the tops of the micromesas, the continuous electrode layer being substantially co-extensive with the active area of the light emitting diode;

an electrically conductive mesh deposited on the base semiconducting layer in trenches between the micromesas, the electrically conductive mesh defining a continuous electrode that is substantially co-extensive with the active area of the light emitting diode; and

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a discrete electrode disposed outside of the active area of the light emitting diode, the discrete electrode electrically communicating with the conductive mesh.

21. The flip chip light emitting diode as set forth in claim 20, wherein the discrete electrode and the continuous electrode layer are adapted for flip chip
5 bonding to an associated support.

22. The flip chip light emitting diode as set forth in claim 20, further including:

a conductive finger extending from the discrete electrode into the active area of the light emitting diode to effect electrical communication of the discrete
10 electrode with the continuous electrode defined by the conductive mesh.

23. The flip chip light emitting diode as set forth in claim 20, further including:

an insulating film disposed between the continuous electrode layer and the continuous electrode defined by the conductive mesh, the continuous electrode
15 layer and the continuous electrode defined by the conductive mesh being electrically isolated from one another by the insulating film.